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(71) Applicant(s)
Monarch Marking Systems Inc

(Incorporated in USA - Delaware)

170 Monarch Lane, Miamisburg, Ohio 45342, United States of America

(72) Inventor(s)
Kelly Lane Johnson
Mark William Roth

(74) Agent and/or Address for Service
Reddie & Grose
16 Theobalds Road, LONDON, WC1X 8PL, United Kingdom

(54) Mobile multi-printer station printing barcode labels and signs

(57) A mobile multi-printer station (10), on a cart, communicates with a remote host station (12) via radio frequency messages and includes a number of different types of printers (21-24) for printing on different types and sizes of record members such as labels, tags and signs. Radio frequency printer messages from the host station are addressed to the individual printers. Communication parameters may be programmed into a printer on the cart by multiple actuations of a single key to provide a very simple procedure for setting communication parameters.

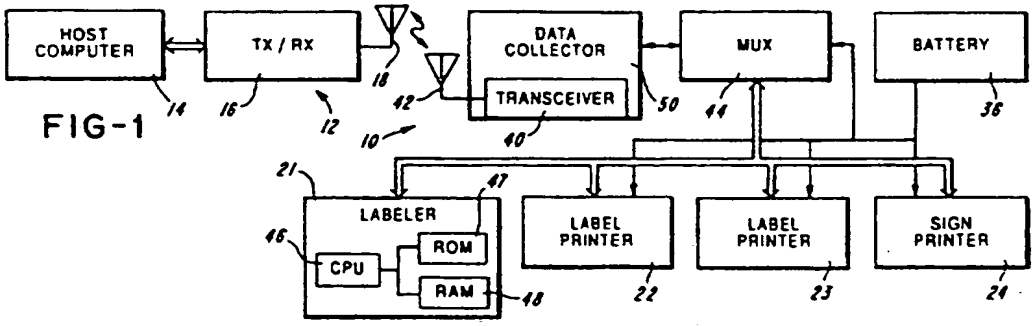


FIG-1

GB 2 303 478 A

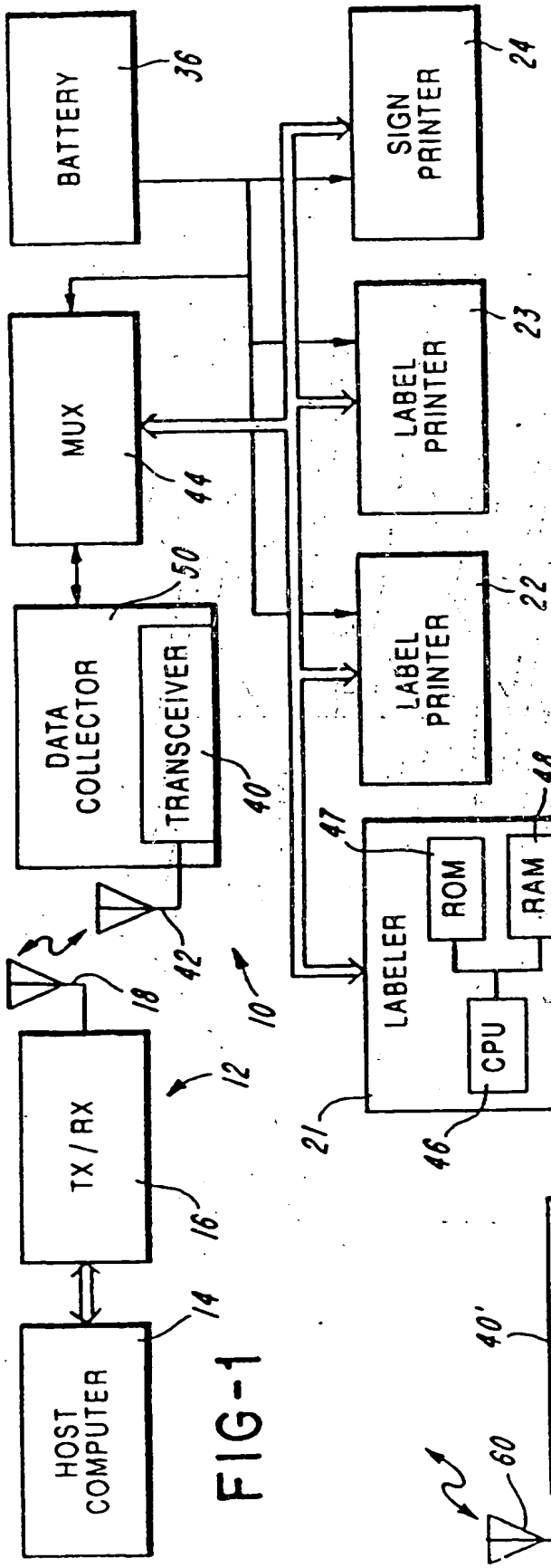

HOST COMPUTER
14
TX / RX
16
12
18
10
DATA COLLECTOR
50
TRANSCEIVER
40
42
MUX
44
BATTERY
36
SIGN PRINTER
24
LABEL PRINTER
23
LABEL PRINTER
22
LABELER
47
ROM
48
RAM
CPU
21
46

FIG-1

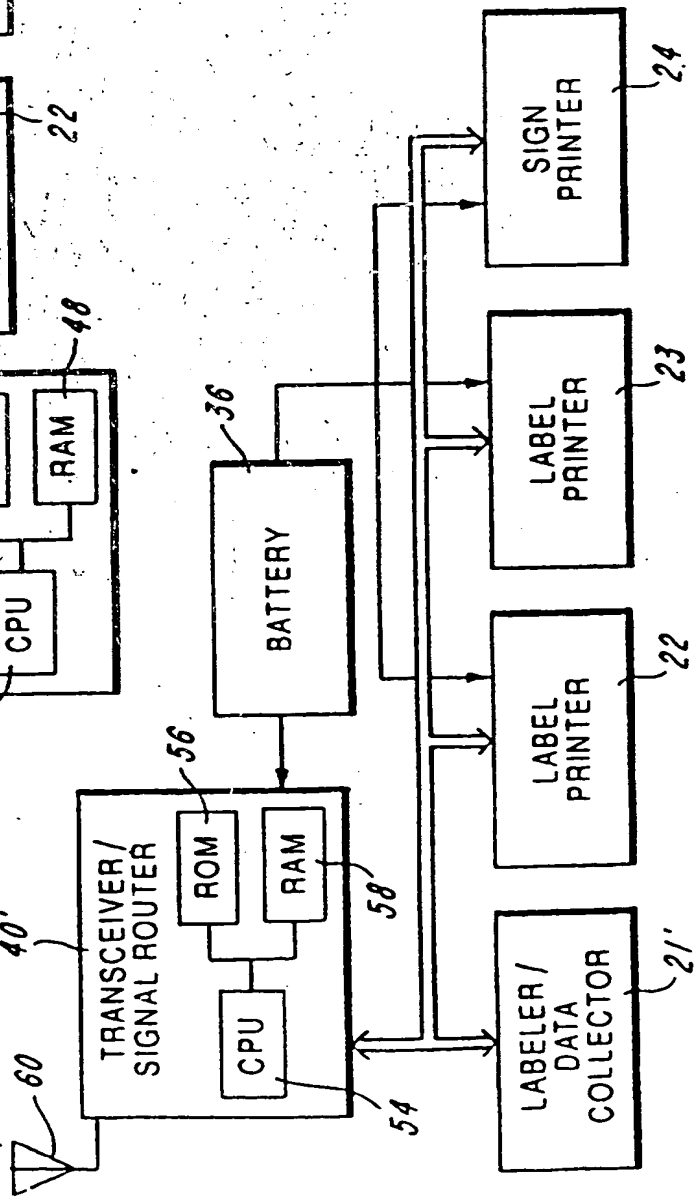

TRANSCEIVER / SIGNAL ROUTER
40'
ROM
56
RAM
58
CPU
54
60
BATTERY
36
SIGN PRINTER
24
LABEL PRINTER
23
LABEL PRINTER
22
LABELER / DATA COLLECTOR
21'

FIG-3

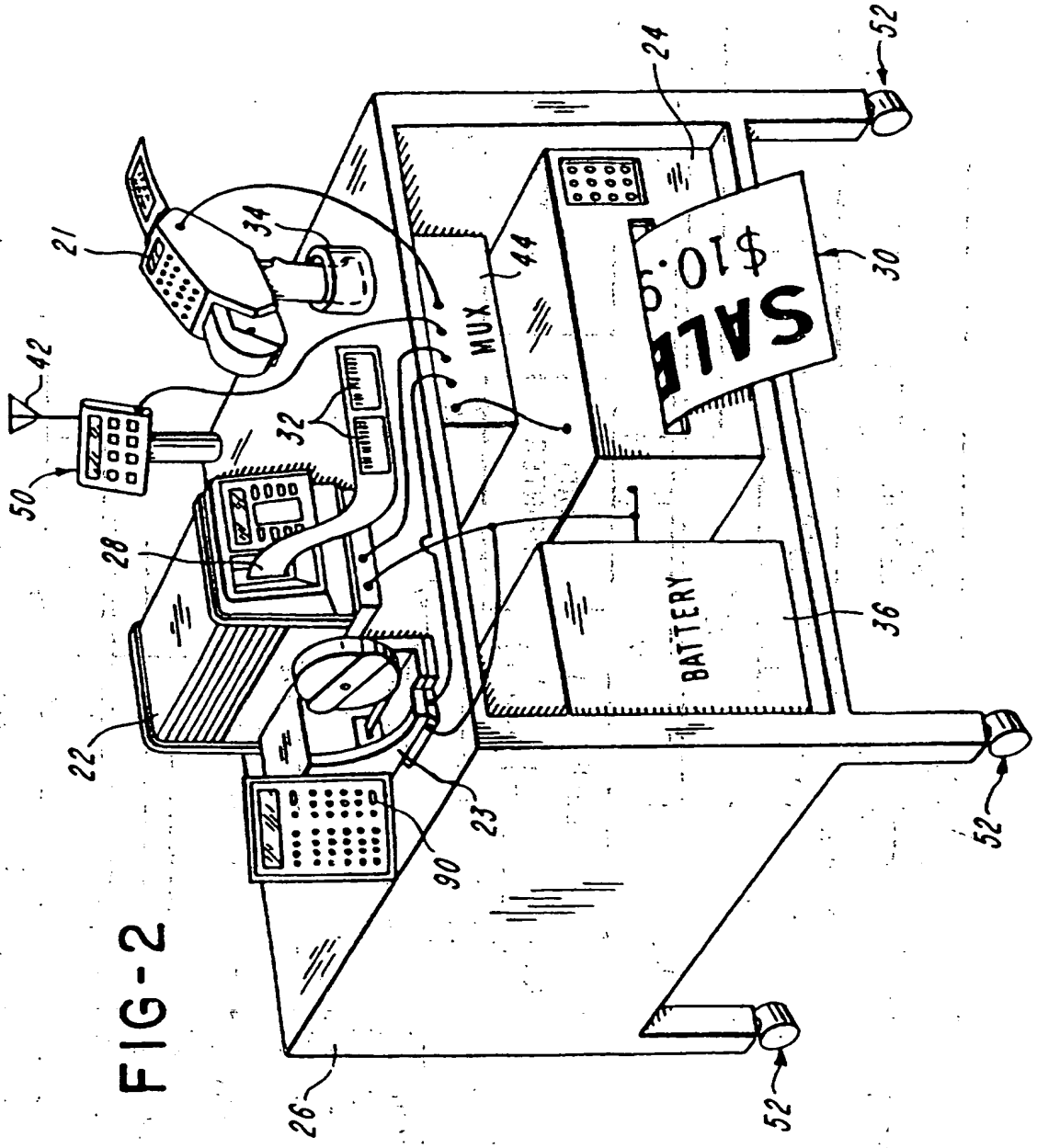

MUX
SALE
$10.9
BATTERY
21
34
44
24
52
30
42
32
50
28
36
22
23
90
26
52
52

FIG-2

FIG-4

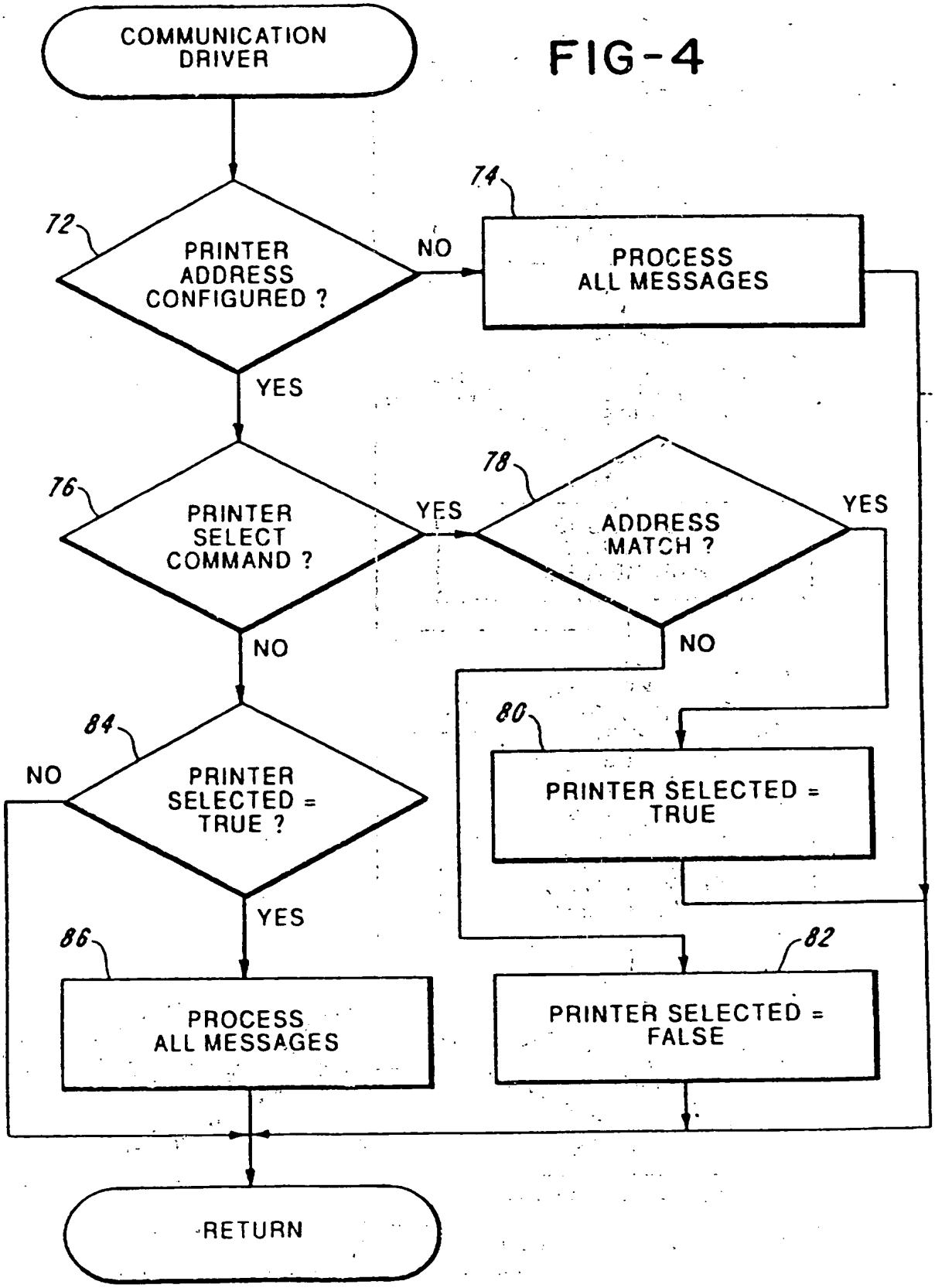
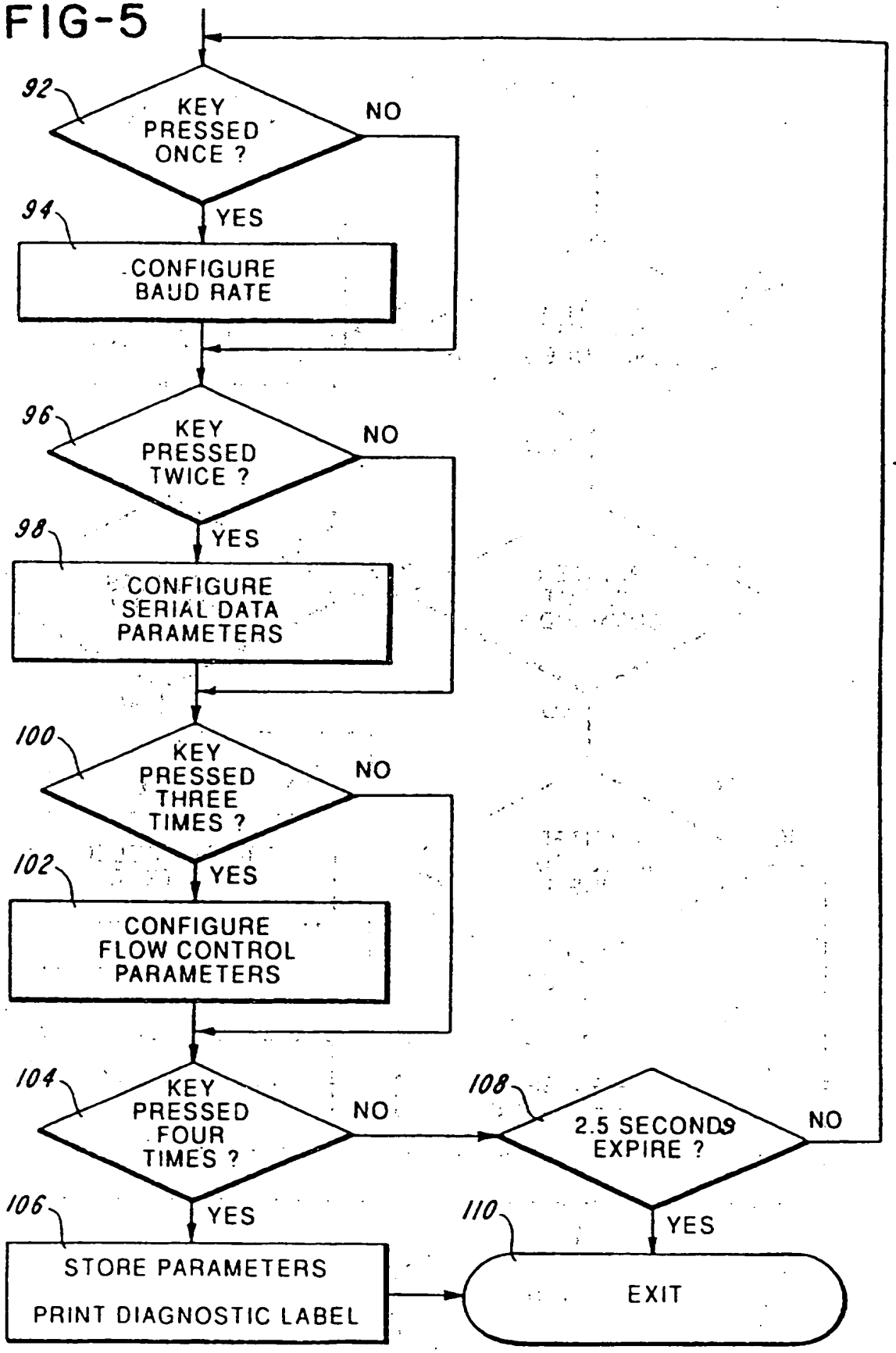

COMMUNICATION DRIVER
72
PRINTER ADDRESS CONFIGURED ?
NO
74
PROCESS ALL MESSAGES
YES
76
PRINTER SELECT COMMAND ?
YES
78
ADDRESS MATCH ?
YES
NO
NO
80
PRINTER SELECTED = TRUE
84
NO
PRINTER SELECTED = TRUE ?
YES
86
PROCESS ALL MESSAGES
82
PRINTER SELECTED = FALSE
RETURN

FIG-5


92
KEY PRESSED ONCE ?
NO
YES
94
CONFIGURE BAUD RATE
96
KEY PRESSED TWICE ?
NO
YES
98
CONFIGURE SERIAL DATA PARAMETERS
100
KEY PRESSED THREE TIMES ?
NO
YES
102
CONFIGURE FLOW CONTROL PARAMETERS
104
KEY PRESSED FOUR TIMES ?
NO
YES
106
STORE PARAMETERS
PRINT DIAGNOSTIC LABEL
108
2.5 SECONDS EXPIRE ?
NO
YES
110
EXIT

MOBILE MULTI-PRINTER STATION PRINTING BARCODE LABELS AND SIGNS

FIELD OF INVENTION

The present invention relates to a multi-printer station and more particularly to a mobile multi-printer station having a radio frequency communicator coupled to a number of printers that are supported on a cart for printing record members of various sizes and shapes based on print data contained in a received radio frequency message.

BACKGROUND OF THE INVENTION

Different printers are known for printing information on record members of various sizes and types. For example, tabletop label and tag printers are known for printing barcodes and alpha-numeric information on a web of record members such as labels and tags. Hand-held labelers are known for printing and applying labels. Laser printers are known for printing on large record members such as signs. Each of these printers typically prints on only one size or type of record member. When used in a retail environment, the location of all of the printers, except for any hand-held printers, is typically fixed and generally not in one common area. If a

record member of a particular size or type is needed, the employee has to go to the location of the printer that is capable of printing that desired record member. This is an extremely inefficient process.

SUMMARY OF THE INVENTION

In accordance with the present invention, the disadvantages of prior printing systems have been overcome. The printing system of the present invention includes a mobile-multi printer station for printing on record members of various sizes and types based on print data contained in a received radio frequency message.

More particularly, a mobile-multi printer station in accordance with the present invention includes a cart for supporting a number of printers includes a barcode printer. A radio frequency communicator supported on the cart receives radio frequency printer messages that include a printer address identifying one of the printers and print data to be printed by that printer. Each of the printers supported on the cart is coupled to the radio frequency communicator to receive printer messages therefrom. Each of the printers includes a memory for storing a printer address and a processor that is responsive to the receipt of information identifying a printer for comparing the information to the stored printer address. The processor is responsive to a match between the received address information and the stored printer address for processing the print data contained in a received printer message.

Each of the printers supported on the cart is preferably a different type of printer, although printers of the same type can be employed, for printing on different types of record members labels and signs. The multi-printer station may be moved to any desired location at which it can receive a radio frequency message from a host station. Therefore, record members of various sizes and types can be generated on the spot at the desired location to increase the efficiency of the labeling and printing operation.

These and other advantages and novel features of the present invention, as well as details of an illustrated embodiment thereof, will be more fully understood from the following description and drawings.

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 is a block diagram of a printing system employing a mobile multi-printer station in accordance with the present invention;

Fig. 2 is a perspective view of a mobile multi-printer station as shown in Fig. 1;

Fig. 3 is a block diagram of an alternate embodiment of a mobile multi-printer station in accordance with the present invention;

Fig. 4 is a flow chart of a printer communication driver contained in each of the printers of the multi-printer station of Fig. 1; and

Fig. 5 is a flow chart illustrating the programming of communication parameters into a printer of the multi-printer station.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A mobile multi-printer station 10 as shown in Fig. 1 receives radio frequency (RF) printer messages from a remote host station 12. The host station 12 includes a host computer 14 for generating the printer messages according to a desired signalling protocol. The generated printer messages are coupled from the host computer 14 to a transmitter/receiver unit 16 or transceiver for transmitting the printer messages via an antenna 18 as a radio frequency message.

The printer station 10 as shown in Figs. 1-2 includes a number of different types of printers 20-24 that are supported on a cart 26 for mobility. Each of the printers preferably prints on a different type or size of record member such as a tag, label or sign. For example, the printers 22 and 23 may be tabletop printers that print information on a web 28 of record members such as tags or labels 32 but the size of the labels generated by the printer 22 may be larger than those generated by the printer 23. The printer 21 is shown as a hand-held labeler for generating and applying labels. The labeler 21 may be supported on the cart in a support fixture 34 or the like if desired. The printer 24 may be a laser printer for printing on large record members such as the sign 30.

Also supported on the cart 26 is a battery 36 for powering any number of the printers. For example, the battery 36 is shown as powering the printers 22-24. The hand-held labeler 21 may include its own battery for supplying power thereto as is well known. The battery 36 thus

forms a common power supply for a number of the printers on the mobile cart 26 so that none of the printers need to be plugged into a wall outlet or the like for power which would impede the mobility of the station.

Although each of the printers 21-24 may be capable of receiving on-line communications including printer data from a host station via a hardwire connection to an RS 232 port or the like on the printer, such hardwire connections prevent true mobility of the multi-printer station 10. Therefore, in accordance with the present invention, the multi-printer station 10 includes a radio frequency communicator 40 that is coupled to an antenna 42 for intercepting RF printer messages. More particularly, the RF communicator 40 may include a transceiver that converts the received analog printer message to received digital printer message information. The digital printer message information is then coupled to each of the printers 21-24 via a signal routing device such as the multiplexor 44 or a serial code switch device.

Each of the printers 21-24 includes a central processing unit (CPU) 46 that operates in accordance with software stored in a type of read only memory 47 to control the operation of the printer to print data stored in a random access memory 48. Upon receipt of printer message information, as discussed in detail below, the CPU 46 compares a printer address contained in the received printer message to printer address information stored in either the ROM 47 or the RAM 48 to uniquely identify the printer. If the CPU 46 determines that the received printer address

matches the stored printer address, the CPU 46 controls the printer to accept for processing subsequently received printer data. If the CPU 46 of a particular printer determines that the received address does not match its stored printer address, the CPU 46 controls the printer to ignore subsequently received printer data.

As shown in Fig. 1, in one embodiment of the present invention the radio frequency communicator 40 is contained in a data collector 50. The data collector 50 preferably includes a barcode scanner for scanning barcode information and a memory for storing the scanned barcode information in the data collector 50 for subsequent transmittal to the remote host station 12 as a radio frequency message.

Because the cart 26 supports a power supply such as the battery 36 for the printers 21-24 and further includes a radio frequency communicator 40 for providing wireless communication to a host computer for receiving print data therefrom, the multi-printer station 10 is completely self-contained and does not require a hardwire connection to any device not supported on the cart 26. The cart 26 has wheels 52 so that it may be easily moved to any location within a given environment from which it is able to communicate via radio frequency signals to the remote host station 12. Thus, regardless of the type of record member that is required at a particular station, such as labels, tags and even signs, the printer station 10 is capable of generating such various printed records at the desired location.

In another embodiment of the present invention as depicted in Fig. 3, one of the

printers, 21' takes the form of a labeler/data collector having a barcode scanner integrated therein. The data collected by the labeler/data collector 21' may be selectively used for printing on a label or for transmittal to the remote host station 12. The RF communicator 40' may include a central processing unit (CPU) 54 that operates in accordance with software stored in a ROM 56 and data stored in a RAM 58. The RF communicator 40' converts intercepted radio frequency signals into a digital printer message information that is routed according to the data contained therein to a particular printer 21', 22, 23 or 24. Alternatively, as discussed above, the RF communicator 40' couples each received printer message to all of the printers 21'-24 connected thereto wherein the printers themselves determine whether the printer messages was intended for them or not.

For wireless communications between the host station 12 and the mobile multi-printer station 10, the following signal protocol may be utilized. The printer message frame is preferably a variable frame that contains the data being sent to a particular printer. The printer message frame includes a number of fields including a preamble, start-of-frame field, source address field, destination address field, protocol ID, type, sequence, length, data and checksum. Each of the printers 21-24 requires the preamble characters before the start-of-frame character in order to recognize the start of a printer message frame. The source address field contains a value that represents the identification of the host station 12. This information allows a printer to respond

to a particular host station 12. The destination address field represents the address identifying a particular printer and is required for a printer to accept and process a printer message frame. Only frames with the printer address that corresponds to the particular printer or a group of printers if so configured, are acted upon. All other printer message frames are ignored. The protocol ID field indicates the type of protocol being used. The various types of protocols may include: a simplex short protocol with one byte of data for length of data field; simplex long protocol with two bytes of data for length of data field; duplex short protocol with one byte of data for length of data field; and duplex long protocol with two bytes of data for length of data field. The type field indicates the type of frame such as a data frame, last data frame, acknowledge frame, associate frame and associate response frame. The sequence field represents a sequence number that is used for duplicated detection and is preferably a four bit value. The length field indicates the size of the data portion of the frame in bytes. This value allows the printer to know how much data is to be interpreted by the printer. The data field contains the printer commands and/or printer data packets and may be for example, up to 64k bytes in length. The checksum field may be a 16 bit value utilizing a CRC-16 checksum. The checksum value is utilized for verification such that this received value must be valid in order for the printer to accept the frame. If the checksum verification fails, the printer will not accept the received printer message frame.

It is noted that if the environment in which the multi-printer station 10 is utilized employs a number of such mobile stations, each station may be provided with its own unique identification that is included in the transmitted printer message. In such an instance, the RF communicator 40 may store the station address information and initially determine whether an intercepted RF message is intended for its station or not. Alternatively, the RF communicator 40 may store information identifying each of the printers 21-24 and may compare a received printer address with one of the stored printer addresses to determine if the received printer messages is intended for a printer at the particular station 10. In still a further embodiment, the RF communicator 40 may couple all messages intercepted by the antenna 42 to the printers 21-24 regardless of whether they were intended for a printer carried on that particular station 10. The printers 21-24 would then individually determine whether a message is intended for that printer or not.

Each of the printers 21-24 preferably operates in accordance with a communication driver software routine as depicted in Fig. 4 for determining whether a received printer message frame is intended for it or not. At the start of this routine, the CPU 46 of the printer determines at a block 72 whether the printer address has been configured in the printer's memory i.e. whether an address is stored for the printer. If not, the CPU 46 proceeds to block 74 to process all messages that are received by the printer. If the CPU 46 determines that the printer address has been configured, the CPU proceeds from block 72 to

block 76. At block 76, the CPU 46 determines whether a printer select command has been received. If so, at block 78 the CPU 46 compares the printer address received with the printer select command to the stored printer address. If the CPU 46 determines at block 78 that the received address matches the stored printer address, the CPU 46 sets a printer selected flag equal to true at block 80. Otherwise, the printer selected flag is set by the CPU 46 at block 82 to false. Thereafter, in processing the received information, the CPU 46 determines at a block 84 whether the printer selected flag is true or not. If the printer selected flag is true, the CPU 46 proceeds to block 86 to process all of the received message information. If not, the remainder of the printer message information is ignored.

In accordance with another feature of the present invention, one or more of the printers 21-24 may allow communication parameters to be set or programmed therein in accordance with the software routine depicted in Fig. 5. Each printer 21-24 employing this routine includes a single key such as the key 90 that is actuated multiple times in order to program the communication parameter data into the printer. The CPU 46 of a printer is responsive to the communication programming key 90 as follows. At block 92, the CPU 46 determines whether the programming key 90 has been pressed once within a predetermined period of time such as 2.5 seconds. If so, the CPU 46 enters a configure baud rate mode at block 92. In the configure baud rate mode of the printer, the CPU 46 may, for example, be responsive to: one subsequent

actuation of the key 90 to set the baud rate to 38.4k baud; two actuations of the key 90 to set the baud rate to 19.2k baud; three actuations of the key 90 to set the baud rate to 9600 baud; four actuations of the key 90 to set the baud rate to 4800 baud; five actuations of the key 90 to set the baud rate to 2400 baud and responsive to six actuations of the key 90 to set the baud rate to 1200 baud. The particular sequence of key actuations must be entered within 2.5 seconds. After this period of time expires, the printer will display information back to the user to confirm the entry of the particular selection. Thereafter, a next programming selection may be made. For example, after configuring the baud rate at block 94, if the programming key 90 is pressed twice, as determined by the CPU 46 at block 96, the CPU enters at block 98 a configure serial data parameters mode. If the programming key is subsequently actuated once in this mode, the serial data parameters may be set equal to: no parity, 8 bit, 1 stop. If the programming key 90 is actuated twice, however, the serial data parameters may be set to even parity, 7 bit, 1 stop for example. If the CPU 46 determines that the programming key has been actuated three times at block 100, the CPU 46 enters a configure flow control parameters mode at block 102. After entering this mode, if the CPU 46 determines that the programming key 90 as been actuated once, the transmitter parameters XON/XOFF are utilized indicating wireless transmission of information. Actuation of the programming key twice in the configure flow control parameters mode identifies the pins RTS/CTS of a RS 232 port for hard wire

control. Actuation of the programming key three times in this mode identifies the DTR pin of a RS 232 port. Actuation of the key 90 six times identifies a simplex frame whereas actuation of the key 90 seven times in this mode identifies a duplex or half-duplex frame. The routine depicted in Fig. 5 allows communication parameters to be easily programmed into a printer have a very limited keyboard; although the routine may also be utilized to allow communication parameters to be simply entered into a printer having a more elaborate keyboard as well.

The mobile multi-printer station 10 in accordance with the present invention allows various types of record members such as labels, tags and signs to be printed at any location within a given environment such as a store to substantially increase the efficiency of marking products, shelves and product areas of the store. Because wires are not needed to connect the printers to either a wall outlet for power or to a host computer to receive print data therefrom, the printer station 10 may be moved to any location at which it can receive radio frequency printer messages from the host station. Many modifications and variations of the present invention are possible in light of the above teachings. Thus, it is to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as described hereinabove.

CLAIMS

1. A mobile multi-printer station capable of communicating with a remote host station having a radio frequency communication device with a transmitter for transmitting radio frequency printer messages comprising:

a cart for supporting a plurality of printers including a barcode printer;

a radio frequency communicator supported on said cart for receiving radio frequency printer messages including information identifying one of a plurality of printers and print data to be printed by said one printer said communicator converting said radio frequency printer message to a digital printer message; and

a plurality of printers coupled to said communicator to receive said digital printer message, each of said printers including a memory for storing a printer address and a processor that is responsive to the receipt of digital information identifying a printer for comparing said information to said stored printer address and said processor processing received digital print data in response to a match between said stored printer address and said received digital information.

2. A mobile multi-printer station as recited in claim 1 including a battery mounted on said cart for powering at least two or more of said printers.

3. A mobile multi-printer station as recited in claim 1 wherein at least one of said printers includes a scanner for collecting data and said radio frequency communicator includes a radio frequency transmitter for transmitting collected data from said one printer.

4. A mobile multi-printer station as recited in claim 1 wherein said radio frequency communicator includes a scanner for collecting data and a radio frequency transmitter for transmitting collected data to said host station.

5. A mobile multi-printer station as recited in claim 1 wherein said radio frequency communicator includes a transmitter for transmitting information received by said interface from one of said printers to said host station.

6. A mobile multi-printer station as recited in claim 1 wherein at least one of said printers includes a keyboard for manual entry of print data into said printer.

7. A mobile multi-printer station as recited in claim 1 wherein said radio frequency communicator interface includes a computer with keyboard for manually entering data to be printed by one of said printers.

8. A mobile multi-printer station as recited in claim 1 including a data collector having a scanner for inputting data to be collected, said data collector being coupled to

said radio frequency communicator for providing collected data thereto and said communication interface includes a radio frequency transmitter for transmitting collected data.

9. A mobile multi-printer station as recited in claim 1 wherein at least one of said printers includes a hand-held labeler for printing data on labels and applying the labels.

10. A mobile multi-printer station as recited in claim 1 wherein at least one of said printers is a sign printer.

11. A mobile multi-printer station as recited in claim 1 wherein said plurality of printers print information on record members of a plurality of types and sizes.

12. A mobile multi-printer station as recited in claim 1 wherein radio frequency communicator includes a memory for storing each of said printer addresses and a processor for comparing said received printer identifying information to said stored printer addresses to determine if said received printer message is intended for a printer on the cart.

13. A mobile multi-printer station as recited in claim 1 wherein said radio frequency printer message includes information identifying a station for which the message was intended and said radio frequency communicator includes a memory for storing information identifying said station and a processor for comparing the station

identifying information in a received printer message to the stored station identifying information to determine if the received printer message was intended for one of the printers supported on said cart.

14. A mobile multi-printer station as recited in claim 1 wherein the memory of at least one of said printers stores communication parameters controlling the way in which said printer communicates with a remote host station and said one printer includes at least one input switch actuable by a user for inputting information to said printer and the processor of said one printer is responsive to multiple actuations of said communication parameters is associated with a predetermined number of switch actuations.

15. A mobile multi-printer station capable of communicating with a remote host station having a radio frequency communication device with a transmitter for transmitting radio frequency printer messages comprising:

a mobile support for a plurality of printers and a power supply;

a plurality of printers of different types carried on said support for printing on record members of various sizes and types, said plurality of printers including at least one barcode printer;

a power supply for powering at least two or more of said printers; and

a radio frequency communicator supported on said cart for receiving radio frequency printer

messages including information identifying one of a plurality of printers and print data to be printed by said one printer, said communicator converting said radio frequency printer message to a digital printer message and each of said printers including a memory for storing a printer address and a processor that is responsive to the receipt of digital information identifying a printer for comparing said information to said stored printer address, said processor processing received digital print data in response to a match between said stored printer address and said received digital information.

16. A mobile multi-printer station as recited in claim 15 wherein at least one of said printers includes a scanner for collecting data and said radio frequency communicator includes a radio frequency transmitter for transmitting collected data from said one printer.

17. A mobile multi-printer station as recited in claim 15 wherein said radio frequency communicator includes a scanner for collecting data and a radio frequency transmitter for transmitting collected data to said host station.

18. A mobile multi-printer station as recited in claim 15 wherein said radio frequency communicator includes a transmitter for transmitting information received by said interface from one of said printers to said host station.

19. A mobile multi-printer station as recited in claim 15 wherein at least one of said printers includes a keyboard for manual entry of print data into said printer.

20. A mobile multi-printer station as recited in claim 15 wherein said radio frequency communicator includes a computer with keyboard for manually entering data to be printed by one of said printers.

21. A mobile multi-printer station as recited in claim 15 including a data collector having a scanner for inputting data to be collected, said data collector being coupled to said radio frequency communicator for providing collected data thereto and said communicator includes a radio frequency transmitter for transmitting collected data.

22. A mobile multi-printer station as recited in claim 15 wherein at least one of said printers includes a hand-held labeler for printing data on labels and applying the labels.

23. A mobile multi-printer station as recited in claim 15 wherein at least one of said printers is a sign printer.

24. A mobile multi-printer station capable of communicating with a remote host station having a radio frequency communication device with a transmitter for transmitting radio frequency printer messages comprising:

a mobile support;

a plurality of printers of different types carried on said support;

a data collector carried on said support said data collector including a scanner to input data to be collected;

a radio frequency communicator supported on said cart for receiving radio frequency printer messages including information identifying one of a plurality of printers and print data to be printed by said one printer, said communicator converting said radio frequency printer message to a digital printer message and each of said printers including a memory for storing a printer address and a processor that is responsive to the receipt of digital information identifying a printer for comparing said information to said stored printer address, and said processor processing received digital print data in response to a match between said stored printer address and said received digital information.

25. A mobile multi-printer station as recited in claim 24 including a battery mounted on said cart for powering at least two or more of said printers.

26. A mobile multi-printer station as recited in claim 24 wherein at least one of said printers includes a keyboard for manual entry of print data into said printer.

27. A mobile multi-printer station as recited in claim 24 wherein at least one of said printers includes a hand-held labeler for printing data on labels and applying the labels.

28. A mobile multi-printer station as recited in claim 24 wherein at least one of said printers is a sign printer.

29. A mobile multi-printer station as recited in claim 24 wherein said plurality of printers print information on record members of a plurality of types and sizes.

30. A barcode printing system comprising:

a radio frequency communicator for receiving radio frequency printer messages including a printer address for identifying a printer and print data to be printed;

a barcode printer coupled to said radio frequency communicator, said printer including a memory for storing a printer address and a processor responsive to a printer address stored in said memory for processing only print data received by said communicator in association with a received printer address matching said stored printer address and said processor being responsive to the absence of a printer address stored in said memory for processing any received print data.

31. A barcode printing system comprising:

a radio frequency communicator for receiving radio frequency printer messages including a printer address for identifying a printer and print data to be printed; and

a barcode printer coupled to said radio frequency communicator including at least one input switch actuatable by a user for inputting information to said printer; a memory for storing

a plurality communication parameters; and a processor responsive to multiple actuations of said input switch for programming said communication parameters into said memory, wherein each of said communication parameters is associated with a predetermined number of switch actuations.

32. A mobile multi-printer station substantially as herein described with reference to the drawings.

33. A barcode printing system, substantially as herein described with reference to the drawings.

The Patent Office

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Application No:	GB 9612458.1	**Examiner:**	Mike Davis
Claims searched:	1-29,32	**Date of search:**	14 August 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G4H (HNEA,HNEC,HNEE)

Int Cl (Ed.6): G06F 3/12

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 1435949 (TEXAS INSTRUMENTS)	-

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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